

Application No. 10/792,342

Reply to Office Action

*REMARKS/ARGUMENTS**The Pending Claims*

Claims 1-13 and 15 are pending. Claims 1-13 and 15 are directed toward a polyurethane polishing pad for chemical-mechanical polishing.

Summary of the Office Action

The Office Action rejects claims 1-11, 13, and 14 under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious in view of U.S. Patent 5,670,102 (hereinafter "Perman") as evidenced by U.S. Patent 6,166,109 (hereinafter "Spitler").

The Office Action rejects claims 1-10 and 13 under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent 6,709,565 (hereinafter "Mayer") in view of U.S. Patent 6,406,363 (hereinafter "Xu").

The Office Action rejects claims 1-10 and 13 under 35 U.S.C. § 103(a) as allegedly unpatentable over Xu in view of WO 01/96434 (hereinafter "Seyanagi"). U.S. Patent 6,777,455 is relied upon as an equivalent form of WO 01/96434. Claims 11-12 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Xu in view of Seyanagi in further view of U.S. Patent 6,790,883 (hereinafter "Ogawa"). Claim 15 is rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Xu in view of Seyanagi in further view of U.S. Patent 6,239,188 (hereinafter "Kihara").

Applicants note, with appreciation, that the rejections over U.S. Patent 4,239,567 in view of Perman and the rejections over Xu in view of Perman are withdrawn.

Discussion of the Anticipation Rejection

The Office Action asserts that Perman explicitly or inherently (as evidenced by Spitler) discloses a microcellular polyurethane meeting all of the structural limitations as required by claims 1-11, 13, and 14, i.e., void volume, cell density, cell size, etc.

However, Perman fails to teach all of the elements recited in the currently pending claims. In particular, Perman fails to teach a polishing pad. Indeed, the Office Action

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acknowledges that the reference "does not teach the microcellular polyurethane can be used to polish a silicone wafer" under the conditions recited in the pending claims (Office Action, p. 3). More generally, Perman fails to teach or suggest that the thermoplastic foams can be formed into a polishing pad. Moreover, Spitler, directed to foam boardstock, fails to cure this deficiency.

In view of the foregoing, Perman fails to teach or suggest all of the elements recited in the claims 1-11, 13, and 14. As such, the anticipation rejection, as well as the alternative obviousness rejection, based on Perman are improper. Applicant respectfully requests the withdrawal of the rejections.

Discussion of the Obviousness Rejections

As is well-settled, in order to establish a prima facie case of obviousness, three basic criteria must be met: (a) there must be some suggestion or motivation to modify the reference or to combine reference teachings, (b) there must be a reasonable expectation of success, and (c) the combination of the prior art references must teach or suggest all the claim limitations. See e.g., M.P.E.P. § 2143 (8th edition as revised August 2005). The obviousness rejections are improper because at least one of the criteria is not met for each of the combinations of (a) Mayer and Xu and (b) Xu and Seyanagi.

A. Mayer and Xu

The Office Action asserts that Mayer discloses a non-abrasive electropolishing pad which, based on the disclosed cell size and void volume, would inherently have a cell density within the claimed range. While the Office Action acknowledges that Mayer fails to disclose that the pad is constructed from polyurethane, the Office Action asserts that it would have been obvious to one having ordinary skill in the art to employ the microcellular foam of Xu to make a polishing pad of Mayer.

Mayer is directed to electropolishing a metal layer having recessed and raised regions (col. 7, lines 26-29). According to Mayer, a pad is used in conjunction with an electrolyte solution to differentially increase the agitation rate of the electrolyte solution at the raised regions on the surface of the metal layer, which are in closer proximity with the pad, and thereby increase the polishing rate at the raised regions (col. 7, lines 44-61). In one embodiment, the pad is non-abrasive (col. 4, lines 4-5). While the pad can be in contact with

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the raised regions on the surface of the metal layer, i.e., the process can include a mechanical element of polishing, the polishing of the metal layer occurs primarily by electropolishing (col. 8, lines 24-27).

Thus, the combination of references also fails to teach or suggest all of the claim limitations. Particularly, none of the references teaches or suggests a polyurethane polishing pad for chemical-mechanical polishing which can polish a *silicon dioxide* wafer at a rate of at least 600 Å/min under the recited conditions as required by the pending claims. A non-abrasive pad, such as the pad disclosed in Mayer, cannot polish silicon dioxide at such a substantial rate because silicon dioxide polishing requires a large mechanical component. See M.R. Oliver, "CMP Technology," Chemical-Mechanical Planarization of Semiconductor Materials, Chapter 2, (Springer, 2004), pp. 12-14 (discussing the asperity-abrasive model for CMP of silicon dioxide) (submitted in Response to Office Action, dated July 6, 2005).

Furthermore, the disclosure Xu and Mayer fails to provide motivation to one of ordinary skill the art to produce a polishing pad using the polyurethane foam of Xu. Mayer is silent as to a suitable material for constructing an electropolishing pad. Instead, Mayer generally discloses that the pad should be chemically compatible with the electrolyte and allow electrical current to flow through it (col. 8, lines 28-31). Thus, Mayer does not provide any specific guidance to turn to the field of chemical-mechanical polishing, i.e., the field encompassed in Xu, in selecting a material for an electropolishing pad. In fact, Mayer distinguishes chemical-mechanical polishing from electropolishing (col. 8, lines 21-24).

In view of the foregoing, the present invention must be considered unobvious, and the obviousness rejection based on Mayer and Xu should be withdrawn.

B. Xu and Seyanagi

The Office Action asserts that Xu discloses a microcellular polyurethane polishing pad having a smooth or textured surface. While the Office Action acknowledges that Xu does not disclose the cell density of the microcellular polyurethane, the Office Action asserts that Seyanagi inherently discloses a cellular polyurethane foam with the 10^5 cells/cm³ or greater. Furthermore, the Office Action asserts that it would have been obvious to one having ordinary skill in the art to employ the cellular polyurethane foam taught by Seyanagi in the pad of Xu.

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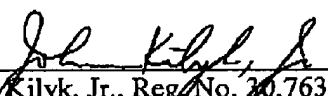
Contrary to the Office Action's assertions, one of ordinary skill in the art, at the time of the invention, would not have been motivated to combine Xu and Seyanagi in such a way as to arrive at the invention defined by the pending claims, i.e., a polishing pad comprising no externally produced surface texture. Seyanagi discloses that the polishing sheet comprising the cellular polyurethane foam "is characterized with grooves that demonstrate a function in which polishing waste and polishing agent are removed off from a contact surface between a face to be polished and a polishing sheet to the outside, and are prepared on a sheet surface" (col. 4, lines 15-19). Indeed, rather than motivating one of ordinary skill in the art to modify the pad disclosed in Xu in such a way as to arrive at the invention defined by the pending claims, Seyanagi specifically teaches the benefits of adding external texture to the surface. Thus, if anything, the combination of Xu and Seyanagi teaches away from the present invention. Furthermore, neither Ogawa nor Kihara cure the deficiencies of the combination of Xu and Seyanagi.

In view of the foregoing, the subject matter of the pending claims cannot properly be considered obvious over Xu and Seyanagi. Accordingly, the Applicant respectfully requests that the obviousness rejections be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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